Missouri S&T's Peer to Peer

Volume 1 | Issue 1 Article 4

February 2016

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S&T's Peer to Peer: An Undergraduate Research Journal (Vol 1; Issue 1 – 2016)

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In recent decades, mobile devices have taken the world by storm, with their continual reduction in size and resounding usefulness. With the portable technology market continually expanding, more and more tech gadgets are becoming available to the modern-day consumer. Google Glass, smart watches, and numerous other devices are adding countless features and conveniences, including effective notification systems as well as fast and easy access to content without even lifting a finger. In general, as this surge of modern tech endures, finding new and innovative uses for these devices as they advance continues to be a fascinating and challenging experience for developers.

While we have seen the birth of a new technological era in past years, we also have unfortunately seen the drastic increase in the number of cases of diabetes mellitus. In the United States alone, an estimated 29 million people are currently affected by the disease, with approximately 1.7 million more being diagnosed each year (CFDC, 2013). The reason for this drastic increase has commonly been attributed to the degradation of both diet and exercise habits. Prevention and treatment of diabetes has been the growing concern of many health professionals, with dedicated researchers looking to find new and effective medications for lowering blood glucose, some of which have included oral medications for type 2 diabetics as well as inhalable insulin. In general, making these treatments affordable and available to the general public is a huge concern when moving forward.

Although the use of drugs can sometimes provide the most immediate results in terms of the improvement of diabetes, more natural treatments often times can return huge benefits in comparison (Wing, 2001). For example, in the case of type 2 diabetes, proper diet and exercise can drastically reduce

the need for medications, and in some instances with prediabetes, reduce the need altogether (Diabetes Prevent Program Research Group, 2002). Inducing these types of lifestyle changes for many is not easy and requires patience and diligence. Therefore, finding practical and convenient ways in assisting individuals with these changes is an important step in reducing the disease's impact.

Using One Trend to Treat Another

As mobile technologies have advanced, the idea of using them in health care applications has expanded greatly. In a 2011 paper by Boulos et al, the impact of mobile technology such as smartphones in health care was examined. Numerous benefits of the implementations were noted, such as how smartphones are able to provide a connection between both doctors and patients due to the network access capabilities of the device. Additionally, using the existing monitoring and sensor technologies on a smartphone can eliminate the need for other external devices, thus reducing the maintenance required by the patient. All in all, keeping the system simple for the users, and providing them with little room for error, is the key for success

One implementation of portable and wearable technology in health care is the use of fitness trackers to measure and document general physical activity data throughout the day. In the case of smart watches, the device is generally worn for the majority of the day and requires little interaction from the user. The device could then proceed to collect data with its many sensors, often including an accelerometer, heart rate monitor and gyrometer. From these sensors, general conclusions about physical activity levels could be drawn and expressed in several different forms - step count, for example. Consequently, the pairing of this data with a notification system to communicate daily physical activity with the user at regular intervals could help in both the prevention and treatment of diabetes, as it may help to passively encourage individuals to achieve higher fitness goals (Fritz, 2014). Hopefully, this

encouragement from the device would help individuals to live a more active lifestyle, thus improving their general health. In addition, the presence of the data on a median with networking capabilities, such as the Bluetooth capabilities of a smart watch, would allow for physicians to easily access information, assuming the patient wishes to share it.

Another instance in which mobile and wearable devices show promise for assisting diabetics is in the field of sensor networks, such as the one laid out in the 2009 paper by Georga et al. Similar in nature to the previously mentioned implementation of a fitness tracking device such as a smart watch, a sensor network would use analytical techniques to combine data from multiple sensor apparatuses to find correlations between the different sets of information. These correlations would then be used by both the patient and physician to change the current treatment for disease. In general, this type of analysis could prove especially useful to type 1 diabetes, as medical devices such as continuous glucose monitors, which are commonly used, could be combined with physical activity levels through the day. Thus, by examining the different data sets, correlations may be found between the physical activity levels and glucose levels.

A theoretical real world example of this sensor network implementation can be viewed as follows: Take a type 1 diabetic patient who has just exercised for about 45 minutes. This physical activity would likely cause the individual's blood glucose to drop. This drop would be recorded by a continuous glucose monitor, and in conjunction the physical activity would be recorded by several sensors in both a smart watch and/or smartphone. The data collected would then be sent over the internet to servers that would analyze the information using algorithms generated using previously collected data from the patient. The resulting correlations from the analyzed information would then be communicated back to the individual, and in this specific case, it may recommend that the user reduce the amount of insulin given at the next meal, or if an insulin pump is used, reduce the amount of basal insulin given for a

specific period of time. In general, this type of implementation could allow for much tighter control of blood glucose, while allowing less room for user error.

Progress Comes with Time

While these implementations of sensor networks could be of great use to diabetics, several factors currently hinder their plausibility. In regards to continuous glucose monitoring, the accuracy of current sensor technology only allows for the general trends of glucose levels to be viewed. Future advances in the technology, however, such as the hopeful replacement of electrochemical biosensors with nanoscale biosensors could greatly improve the accuracy and lifespan of the device (Scognamiglio, 2013). On another note, a considerable amount of research and development must be devoted in order to foster improvements in the data analysis techniques needed for the sensor network. These techniques would use similar methods employed in different data mining implementations, such as those discussed in a paper by Ryan Meuth (2009).

Overall, in using the developing technologies of wearable devices, solutions to pressing issues such as the prevention and treatment of diabetes can be accelerated. While further research and development needs to be made with the different sensors and analytical techniques applied in the solutions presented, the framework provided has the potential to help millions of people, once properly implemented.

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